

MEMBERS OF THE SPECIFICATIONS AND STANDARDS COMMITTEE

1. N. Sivaguru (Convenor)	Addl. Director General (Roads), Ministry of Surface Transport (Roads Wing)
2. K. Arunachalam (Member-Secretary)	Superintending Engineer (Roads) Ministry of Surface Transport (Roads Wing)
3. V.K. Arora	Chief Engineer (Roads), Ministry of Surface Transport (Roads Wing)
4. R.C. Arora	Manager (Asphalt), Hindustan Petroleum Corpn. Ltd., Bombay
5. R.T. Atre	Secretary to the Govt. of Maharashtra (I) Public Works Department
6. Y.N. Bahl	Retd. Chief Engineer, Haryana P.W.D. B & R,
7. S.P. Bhargava	Superintending Engineer (Roads), P.W.D., Rajasthan
8. P.C. Bhasin	Adviser (Technical), Hooghly River Bridge Commissioners, Calcutta
9. Dr. P. Ray Choudhary	Deputy Director, & Area Co-ordinator, Central Road Research Institute
10. Dharam Vir	Chief Engineer (NH) & Hill Co-ordinator, U.P. P.W.D.
11. Dr. M.P. Dhir	Director, Central Road Research Institute
12. T.A.E. D'sa	Chief Engineer, The Concrete Association of India, Bombay
13. V.P. Gangal	Superintending Engineer, New Delhi Municipal Committee
14. R.A. Goel	Engineer-in-Chief, Haryana P.W.D. B & R
15. Y.C. Gokhale	Retd. Deputy Director, Central Road Research Institute
16. I. C. Gupta	Retd. Engineer-in-Chief, P.W.D., B & R Haryana
17. S.S. Das Gupta	Manager (Bitumen), Indian Oil Corpn. Limited Bombay
18. M.B. Jayawant	Neelkanth, 24, Carter Road, Bandra Bombay
19. Dr. L.R. Kadiyall	Engineering Consultants Pvt. Ltd. New Delhi
20. Dr. S.K. Khanna	Secretary, University Grants Commission
21. G.P. Lal	Chairman, Bihar Rajya Pul Nirman Nigam Ltd.
22. Dr. N.B. Lal	Deputy Director & Head, Soil Stabilization, Central Road Research Institute
23. P.K. Lauria	Chief Engineer, P.W.D., B & R, Rajasthan
24. K.S. Logavrinayagam	181-B, 54th Street, Ashok Nagar, Madras
25. J.M. Malhotra	Secretary to the Govt. of Rajasthan P.W.D.
26. O. Muthachen	Poomkavil House, Somangalam, Punalur (Kerala)
27. P.K. Nagarkar	Chief Engineer & Director, Maharashtra Engg. Research Institute
28. B.R. Tyagi	Deputy Manager, Indian Oil Corpn. Ltd. Faridabad
29. T.K. Natarajan	Deputy Director, & Head, Soil Mechanics Division, Central Road Research Institute
30. A.N. Nanda	Engineer-in-Chief-cum-Secretary to the Govt. of Orissa,
31. Y.R. Phull	Deputy Director, & Head, Roads Division, Central Road Research Institute

CONTROLLED
(SWI)

IRC : 96-1987

**TENTATIVE SPECIFICATION
FOR
TWO-COAT SURFACE
DRESSING USING CATIONIC
BITUMEN EMULSION**

Published by
THE INDIAN ROADS CONGRESS
Jamnagar House, Shahjahan Road,
New Delhi-110 011
1990

32/5
Price Rs. 48
(plus packing & postage)

TENTATIVE SPECIFICATION FOR TWO-COAT SURFACE DRESSING USING CATIONIC BITUMEN EMULSION

1. INTRODUCTION

1.1. Bitumen emulsion offers a new set of possibilities for the solution of problems faced in road paving works. Its usefulness in reducing the consumption of fuel, reduction in pollution while heating and spraying, wide adoptibility to all types of aggregates, lesser susceptibility to wet weather conditions, lower equipment investments and easier mobilisation in remote regions makes it a viable choice for road works. Recognising these benefits, the Bituminous Pavements Committee took up the drafting of this Specification.

1.2. The initial draft for this Specification was prepared by Shri M.B. Jaywant. The Bituminous Pavements Committee in their meeting held on the 29th September, 1977 modified the Specification. The modified Specification was circulated by the Indian Roads Congress to the Chief Engineers of States and the Director General Border Roads, to carry out trials and report on their performance for taking a decision on the Specification to be recommended. The Bituminous Pavements Committee (personnel given below) after considering all relevant information finalised this Specification at its meeting held at Madras on the 13th March, 1987.

Prof. C. G. Swaminathan
P. Bhaskaran

...*Convenor*
...*Member-Secretary*

MEMBERS

U. K. Aggarwal
G. R. Ambwani
R. C. Arora
Dr. Arun Kumar
R. T. Atre
A. K. Bhattacharya
S. P. Bhargava
P. C. Bhasin
G. C. Gupta
R. A. Goel
Y. C. Gokhale
O. P. Gupta
S. S. Das Gupta
M. B. Jayawant
V. P. Kamdar
P. K. Lauria
V. Krishna Murthy
B. K. Malhotra

K. P. Nair
A. N. Nanda
T. H. Peshori
Lt. Col. Kamlesh Prakash
R. K. Saxena
Sheonandan Prasad
N. Sivaguru
G. M. Shonthu
A. Sankaran
S. K. Malhotra
A. Venkatarangaraju
C. D. Thatte
Balbir Singh
R. K. Samanta
A. K. Roy
Rep. of Kerala Highway
Research Institute (P.K.C. Raja)
N. S. Rama Sharma

The President, Indian Roads Congress and Director General (Road Development) & Addl. Secretary to the Govt. of India (K.K. Sarin)

—*Ex-officio*

The Secretary, Indian Roads Congress (Shri Ninan Koshi)

—*Ex-officio*

1.3. The above draft document as approved by the Bituminous Pavements Committee in their meeting mentioned above was considered by the Specifications and Standards Committee in their meeting held on the 23rd April, 1987. Later on the draft document was approved by the Executive Committee and the Council in their meetings held on the 28th April, 1987 and 22nd May, 1987 respectively for being published as the finalised Specification of the Indian Roads Congress.

2. SCOPE

2.1. The method of construction for two-coat surface dressing using cationic bitumen emulsion differs from that using paving grade bitumen. Owing to its low viscosity, cationic bitumen emulsion tends to flow if the quantity of emulsion for the first coat is more. Hence for the first coat, less quantity of emulsion is recommended and more quantity is used for the second coat, since the surface developed after the first coat can hold this extra quantity in place.

2.2. The method of surfacing detailed in this specification consists of the application of cationic bitumen emulsion on the previously prepared pavement surface, covering it with aggregate and rolling. A second coat using the same procedure is followed to complete the treatment. The quantities of aggregate and emulsion for each coat shall be as in para 3.3.

3. MATERIALS

3.1. Binder

The binder shall be of cationic type bitumen emulsion of RS Grade (Rapid Setting) complying with IS : 8887-1978 and having bitumen content 60 per cent minimum by weight. The emulsion is said to have set when the water breaks away leaving the black residual bitumen on the surface.

3.2. Aggregate

3.2.1. **General requirements :** The cover aggregate shall consist of crushed rock or crushed gravel and shall have fairly cubical fragments free from deleterious matter, dust, ash or other adherent coatings. Uncrushed, rounded gravel shall not be used.

Wet aggregate can be used for surface dressing, with cationic bitumen emulsions and hence when aggregates are dusty, they

should be cleaned by dipping or washing or by sprinkling water copiously.

Aggregates having stripping value higher than the permissible limit can be considered for use, limited to the extent of the anti-stripping properties of such emulsions, as directed by the Engineer-in-Charge. Cationic emulsions, because of their very nature, have better adhesive properties with wet aggregates as well as aggregates having stripping tendencies.

3.2.2. Physical requirements : The aggregate shall satisfy the following physical requirements :

<i>Test</i>	<i>Requirement</i>	<i>Test Method</i>
(1) Los Angeles Abrasion Value or Aggregate Impact Value	Max. 40% Max. 30%	IS : 2386 (Part-IV) —do—
(2) Flakiness Index	Max. 25%	IS : 2386 (Part-I)
(3) Stripping Value ¹	Max. 25%	IS : 6241
(4) Water Absorption ²	Max. 1%	IS : 2386 (Part-II)
(5) Soundness :		
Loss with sodium sulphate 5 cycles	Max. 12%	IS : 2386 (Part-V)
Loss with Magnesium sulphate 5 cycles	Max. 18%	—do—

Notes : 1. Stripping value need not be given too much importance when cationic emulsion is used. See also para 3.2.1.

2. Water absorption upto 2 per cent might be permitted in exceptional cases.

The aggregate shall conform to following sizes :

- (1) For first coat: 13.2 mm size —passing 19 mm sieve and retained on 9.5 mm sieve
- (2) For second coat: 6.7 mm size —passing 9.5 mm sieve and retained on 2.36 mm sieve

3.3. Quantities of Materials

	<i>Per 10 sq. metre area</i>	
	<i>For first coat</i>	<i>For second coat</i>
Cationic bitumen emulsion	12 to 14 kg	16 to 18 kg
Aggregate	0.10 to 0.12 m ³	0.06 to 0.08 m ³

4. CONSTRUCTION

4.1. Weather Limitations

Cationic bitumen emulsions should not normally be stored below zero degree Celsius. However, surface dressing with the emulsion should be carried out only when the atmospheric temperature is above 10°C. The work can be carried out when the base is damp. All standing water in depressions should be removed.

4.2. Preparation of Base

4.2.1. The existing base on which surface dressing is to be laid shall be prepared, shaped and corrected to a uniform grade and camber. All depressions and potholes shall be filled up and well compacted sufficiently in advance.

4.2.2. The surface should be cleaned to remove all loose particles, dust and foreign matter. It is preferable to spray water on the surface to wash away the loose dust and to expose a clean surface of aggregate in the case of granular base courses.

4.3. Preparation of Binder

Before opening, the cationic bitumen emulsion drums should be rolled at slow speed, to and fro, for a distance of about 10 metres, 5 to 6 times to mix the contents properly.

4.4. First Coat

4.4.1. **Application of binder :** Cationic bitumen emulsion should be sprayed uniformly on the prepared base by mechanical sprayers. In exceptional cases, spraying from a spraying-can may be resorted to as directed by the Engineer-in-Charge. An emulsion tank of 30 litre capacity pressurised by compressed air from a hand pump and a 12 mm flexible pipe with a spray nozzle is a simple and efficient arrangement for spraying.

While using pouring-cans, the holes should be kept as 6 mm diameter spaced 30 mm apart, to prevent clogging.

4.4.2. Application of aggregate : Immediately after spraying of the cationic emulsion, aggregate of 13.2 mm size shall be spread uniformly to cover the surface completely and evenly. Any oversize aggregate, if seen, should be removed.

4.4.3. Rolling : Immediately after the application of cover material, the surface shall be rolled with a 6 to 8 tonne roller, preferably a smooth wheeled tandem type. Rolling shall begin at the edges and proceed towards the centre, parallel to the centre line except in superelevated portions where it shall proceed from the inner edge to the outer. While rolling, aggregate shall be added or removed so as to ensure an uniformly covered surface. Each pass of roller shall uniformly overlap not less than one-third of the track made in the preceding pass. Rolling shall continue for just enough time to embed the aggregates in the binder and present an uniform closed surface. Excessive rolling, resulting in crushing of aggregate should be avoided.

4.5. Second Coat

4.5.1. Time interval : The second coat of surface dressing should be applied on the same day as the first coat but not earlier than one hour after the rolling of the first coat.

4.5.2. Application of emulsion for the second coat : Traffic should not be allowed on the first coat before the application of second coat. The aggregates of the first coat are likely to appear loose and unbonded in a few spots. These should not be disturbed. They will get bonded once the emulsion breaks or sets.

The cationic bitumen emulsion for second coat should be sprayed by mechanical sprayer or in exceptional cases by using pouring—can taking care not to disturb the first layer while walking over it.

4.5.3. Application of aggregate : Immediately after the application of emulsion, 6.7 mm size chips should be spread uniformly to cover the whole surface.

4.5.4. Rolling : Rolling shall start soon after spreading the aggregate and all operations carried out as per para 4.4.3. to achieve a uniform closed surface.

Normally, 6 to 8 passes with 6-8 tonne smooth-wheel roller are adequate.

4.6. Finishing

After one pass of the roller, depressions should be filled up with 6.7 mm size aggregate. If excess of aggregate is found in isolated spots, the bigger size aggregate should be removed to give an uniform surface. Finish rolling on the next day, this helps to give a firm surface.

4.7. Opening to Traffic

Though the road may be opened to traffic 4 hours after completing rolling of the second coat, it is however, preferable that 24 hours lapse before traffic is allowed.

Where the road is of single lane, traffic can be allowed at a slow speed of not more than 10 km per hour making sure to add aggregate and emulsion wherever the surface has been picked up by traffic.

32. Col. V.K. Rao Addl. Chief Engineer, Engineer-in-Chiefs Branch
Siliguri
33. G. Raman Director (Civil Engg.), Bureau of Indian Standards
34. Prof. M.S.V. Rao Former Head of the Deptt. of Traffic & Transportation
School of Planning & Architecture, New Delhi
35. V.S. Rane Retd. Secretary to the Govt. of Maharashtra,
P.W.D.
36. A.K. Roy Chief Engineer, (NH) West Bengal Public Works
(Roads) Directorate
37. Maj. Gen. J.C. Sachdeva Retd. Director General Border Roads
38. Dr. O.S. Sahgal Principal, Thapar Institute of Engineering &
Technology, Patiala-147 101
39. Satish Prasad 125, Nehru Apartment, Kalkaji, New Delhi
40. Dr. A.C. Sarna Deputy Director & Head, Traffic Division, Central
Road Research Institute
41. A. Sankara Chief Engineer Central Public Works Department
42. N. Sen Chief Engineer (Retd.) 12-A, Chitranjan Park,
New Delhi
43. R.K. Saxena Chief Engineer, Ministry of Surface Transport
(Roads Wing)
44. Rajiv Saxena National Information Centre, New Delhi
45. G.M. Shonthu Chief Engineer, Kashmir P.W.D. B & R
46. S.B.P. Sinha Engineer-in-Chief (Vigilance), Road Constn.
Deptt., Patna
47. J.S. Sodhi Chief Engineer (South), Punjab P.W.D., B & R
48. Dr. N.S. Srinivasan Executive Director, National Transportation
Planning & Research Centre
49. Prof. C.G. Swaminathan Retd. Director, Central Road Research Institute
50. Ravinder Kumar Director, U.P. Research Institute P.W.D. Lucknow
51. C.D. Thatte Director, Gujarat Engg. Research Instt. Vadodara
52. A. Venkatarangaraju Director, Highways Research Station, Guindy,
Madras
53. B.K. Samanta Director, R & B Research Institute, West Bengal
54. Nataraja Damodaran Chief Engineer (Roads & Bridges) & Ex-officio
Addl. Secretary to the Govt. of Kerala P.W.D.
55. The President, Indian Roads Congress & Director General (Road Develop-
ment) & Addl. Secy. to the Govt. of India (K.K. Sarin) Ex-officio
56. The Secretary, Indian Roads Congress (Ninan Koshi) Ex-officio